

1. A drawing device for attenuating a plurality of filaments received from a spin pack of a meltspinning apparatus, comprising:

at least one manifold including an inlet receiving the plurality of filaments from the spin pack, an outlet and a slotted passageway extending therebetween, said at least one manifold having a slot from which a high-velocity flow of air in the passageway effective to attenuate the filaments, the filaments and the flow of air being discharged from said outlet in a discharge direction;

a first plurality of guides positioned proximate to said outlet and aligned in a first row, each of said first plurality of guides inclined at a first angle relative to said discharge direction; and

a second plurality of guides positioned proximate to the outlet of the filament drawing device and aligned in a second row, each of said second plurality of guides positioned between an adjacent pair of said first plurality of guides, and each of said second plurality of guides inclined at a second angle relative to said discharge direction,

wherein said first plurality of guides and said second plurality of guides cause the flow of air and the filaments to deviate from said discharge direction.

2. The drawing device of claim 1 further comprising:
a plurality of connecting surfaces each extending between one of said first plurality of guides and one of said second plurality of guides to eliminate open spaces therebetween.
3. The drawing device of claim 1 wherein said first angle is equal to said second angle.
4. The drawing device of claim 1 wherein said first angle is in the range of 3° to 30°.
5. The drawing device of claim 4 wherein said second angle is in the range of 3° to 30°.
6. The drawing device of claim 1 wherein said first plurality of guides and said second plurality of guides are inclined symmetrical about a plane containing said discharge direction so that said first angle is equal and opposite to said second angle.
7. The drawing device of claim 1 wherein said first plurality of guides and said second plurality of guide cause the flow of air and the filaments to deviate in opposite upstream and downstream directions relative to said discharge direction.

8. A drawing device for attenuating a plurality of filaments received from a spin pack of a meltspinning apparatus, comprising:

at least one manifold including an inlet receiving the filaments from the spin pack, an outlet, and a slotted passageway extending between
5 said inlet and said outlet, said at least one manifold adapted to apply a high-velocity flow of air in the slotted passageway effective to attenuate the filaments, the filaments and the flow of air being discharged from said outlet in a discharge direction; and

a plurality of guides aligned in a row proximate to said outlet, said
10 plurality of guides each inclined for causing the flow of air and the filaments to deviate from said discharge direction, said plurality of guides having a progressively varying angle relative to said discharge direction.

9. The drawing device of claim 8 wherein said progressively varying angle varies systematically in a pattern.

10. A drawing device for attenuating a plurality of filaments received from a spin pack of a meltspinning apparatus, comprising:

at least one manifold including an inlet receiving the filaments from the spin pack, an outlet, and a slotted passageway extending between
5 said inlet and said outlet, said at least one manifold adapted to apply a high-velocity flow of air in the slotted passageway effective to attenuate the filaments, the filaments and the flow of air being discharged from said outlet in a discharge direction; and

a plurality of guides aligned in a row proximate to said outlet, said
10 plurality of guides each inclined for causing the flow of air and the filaments to deviate from said discharge direction, said plurality of guides having a angle relative to said discharge direction that progressively varies across a width of said outlet.

11. The drawing device of claim 10 wherein said progressively varying angle varies systematically in a pattern.

12. A spunbonding apparatus for depositing filaments on a collector to form a nonwoven web, comprising:

a spin pack capable of forming filaments from a thermoplastic material;

5 a drawing device having an inlet receiving the filaments from said spin pack, an outlet and a slotted passageway extending from the inlet to the outlet, said filament drawing device applying a high-velocity flow of air in the passageway between said inlet and said outlet effective to attenuate the filaments, the filaments and the flow of air being discharged from said outlet in

10 a discharge direction;

a first plurality of guides positioned proximate to said outlet and aligned in a first row, each of said first plurality of guides inclined at a first angle relative to said discharge direction; and

a second plurality of guides positioned proximate to the outlet of
15 the filament drawing device and aligned in a second row, each of said second plurality of guides positioned between an adjacent pair of said first plurality of guides, and each of said second plurality of guides inclined at a second angle relative to said discharge direction,

wherein said first plurality of guides and said second plurality of
20 guides cause the flow of air and the filaments to deviate from said discharge direction.

13. The spunbonding apparatus of claim 12 further comprising:
a plurality of connecting surfaces each extending between one of
said first plurality of guides and one of said second plurality of guides to
eliminate open spaces therebetween.
14. The spunbonding apparatus of claim 12 wherein said first angle is
equal to said second angle.
15. The spunbonding apparatus of claim 12 wherein said first angle is
in the range of 3° to 30°.
16. The spunbonding apparatus of claim 15 wherein said second
angle is in the range of 3° to 30°.
17. The spunbonding apparatus of claim 12 wherein said first plurality
of guides and said second plurality of guides are inclined symmetrical about a
plane containing said discharge direction so that said first angle is equal and
opposite to said second angle.
18. The spunbonding apparatus of claim 12 wherein said first plurality
of guides and said second plurality of guides are faceted.

19. The spunbonding apparatus of claim 1 wherein said first plurality of guides and said second plurality of guide cause the flow of air and the filaments to deviate in opposite upstream and downstream directions relative to said discharge direction.

20. A spunbonding apparatus for depositing filaments on a collector to form a nonwoven web, comprising:

a spin pack capable of forming filaments from a thermoplastic material;

5 a drawing device having an inlet aligned for receiving the filaments from said spin pack, an outlet and a slotted passageway extending from the inlet to the outlet, said filament drawing device applying a high-velocity flow of air in the passageway between said inlet and said outlet effective to attenuate the filaments, the filaments and air being discharged from said outlet

10 in a discharge direction; and

a plurality of guides aligned in a row proximate to said outlet, said plurality of guides each inclined for causing the flow of air and the filaments to deviate from said discharge direction, said plurality of guides having a progressively varying angle relative to said discharge direction.

21. The spunbonding apparatus of claim 20 wherein said progressively varying angle varies systematically in a pattern.

22. A spunbonding apparatus for depositing filaments on a collector to form a nonwoven web, comprising:

a spin pack capable of forming filaments from a thermoplastic material;

5 a drawing device including an inlet aligned for receiving the filaments from said spin pack, an outlet, and a slotted passageway extending from the inlet to the outlet, said filament drawing device applying a high-velocity flow of air in the passageway between said inlet and said outlet effective to attenuate the filaments, the filaments and air being discharged from said outlet
10 in a discharge direction; and

a plurality of guides aligned in a row proximate to said outlet, said plurality of guides each inclined for causing the flow of air and the filaments to deviate from said discharge direction, said plurality of guides having an angle relative to said discharge direction that progressively varies across a width of
15 said outlet.

23. The spunbonding apparatus of claim 22 wherein said progressively varying angle varies systematically in a pattern.

24. A method of forming a nonwoven web, comprising:
- forming filaments from a thermoplastic material;
 - applying a high-velocity flow of air in a drawing device effective to attenuate the filaments, the filaments and the flow of air being directed in a
 - 5 discharge direction from an outlet of the drawing device along with vortices;
 - eliminating the vortices in the high-velocity flow of air; and
 - collecting the filaments on a collection device to form a nonwoven
- web.

25. The method of claim 24 further comprising:
adjusting a separation between the outlet of the drawing device
and the collection device to form a nonwoven web characterized by a strength
ratio in the range of about 2:1 to about 10:1.

26. The method of claim 24 further comprising:
adjusting a separation between the outlet of the drawing device
and the collection device to form a nonwoven web characterized by a strength
ratio in the range of about 1:1 to about 2:1.

27. The method of claim 24 wherein eliminating the vortices
comprises:
placing guides in the path of the vortices at a location adjacent to
the outlet.

28. The method of claim 27 further comprising:
adjusting a property of the guides to form a nonwoven web
characterized by a strength ratio in the range of about 2:1 to about 10:1.

29. The method of claim 27 further comprising:
adjusting a property of the guides to form a nonwoven web
characterized by a strength ratio in the range of about 1:1 to about 2:1.